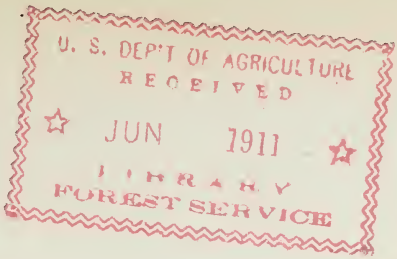

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B. T. GALLOWAY, Chief of Bureau.

AGRICULTURAL OBSERVATIONS ON THE TRUCKEE-CARSON IRRIGATION PROJECT.

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AGRICULTURAL OBSERVATIONS ON THE TRUCKEE-CARSON IRRIGATION PROJECT.

INTRODUCTION.

The Truckee-Carson Irrigation Project in western Nevada was one of the first of the new regions to be opened for settlement under the reclamation act of 1902. Practically all of the public land for which irrigation water is available has now been taken up by settlers. The Bureau of Plant Industry of the United States Department of Agriculture, in cooperation with the Nevada Agricultural Experiment Station, has operated an experiment farm on this project since 1906.[1]

There appears to be considerable popular interest in the agricultural conditions and possibilities of this project, and many letters asking for information concerning the region are received at the experiment farm. This circular has been prepared with a view to answering these inquiries and also to give to the settlers already on the project the results of the experiments and observations made during the past two seasons. It will be noticed that much of the material presented is fragmentary and incomplete. This is due to the fact that the agriculture of the region is still new and that comparatively little definite knowledge as to the agricultural possibilities and the best farming methods has as yet been accumulated.

The Truckee-Carson Experiment Farm is situated 1 mile south of Fallon, Nev. On this farm tests are being made of the adaptability of various field, fruit, and garden crops, including some varieties newly imported from foreign countries. Methods of reducing the salt content of the alkali soil on portions of the experiment farm, so as to make it more suitable for crop growth, are being worked out. The agricultural problems of the project as a whole are being studied in a limited way and cooperative work is being conducted in two of the older orchards in the project.

A small library has been provided at the experiment farm, consisting of a number of agricultural books and periodicals and some of the bulletins from the United States Department of Agriculture and from the State agricultural experiment stations. The farmers on the project are invited to make use of these publications in obtaining information on subjects in which they may be interested.

[1] For additional information on this subject, see Bulletin 157. Bureau of Plant Industry, U. S. Dept. of Agriculture, entitled "The Truckee-Carson Experiment Farm," issued August 11, 1909.

They are also invited to notify the superintendent or to bring specimens to him of diseases or insect pests and to report other difficulties they may be having in connection with growing their crops, so that help may be given if possible.

PHYSICAL FEATURES OF THE PROJECT.

About 35,000 or 40,000 acres of land are now under cultivation on the Truckee-Carson project, most of it lying near the town of Fallon, Nev., which has a population of about 1,000.

Most of the soil is a light sandy loam, but there are also large areas of fertile black soil on the east and south sides of the project. Both the sandy and black soils are good and produce abundant crops, but there are also to be found in most parts of the project small, irregular areas of hard, impervious soil, which are difficult to work and do not usually produce satisfactory crops.

UNDERGROUND WATER.

Portions of some of the farms and also a few larger areas in the project have at present a soil too salty to grow crops. Salt has accumulated mostly in those soils where the ground-water table rises to within a short distance of the surface, establishing a capillary connection and by evaporation leaving deposits of salt on the surface. In those cases where the water table is very close to the surface little or no advantage results from an attempt to wash out the accumulated salt by flooding, the result being, instead, a still higher rise of the ground water, which tends to increase the difficulty. To remedy these conditions deep ditches should be put through, so as permanently to lower the water table. After this is done heavy applications of water to the surface may percolate through the soil and carry with it the excess of the soluble salts. A comprehensive drainage system has been planned for the lower lands of the project, and it only remains for this system to be completed and for farm drains to be constructed; it should then be possible to keep the ground water below the limit of serious harm.

WINDS.

The wind is an important factor on a large part of the Truckee-Carson project, where the soil is sandy and can be easily blown. Windstorms occur occasionally in the spring and are sometimes severe enough to kill new seedings of alfalfa. They are also injurious to small garden stuff that is just appearing above the ground. The winds usually come from the west and, since the damage is due chiefly to the blowing of the sand, young crops may be planted quite safely on the east side of a field on which grain or alfalfa is growing, or sandy fields may be protected by brush fences or hedges.

TEMPERATURES.

Table I, compiled from the records of the United States Weather Bureau, shows approximately the temperature conditions that exist in the region under discussion. It will be noted that the maximum temperature recorded is 103° F. and the minimum —15° F. As a general rule, plowing and leveling land and digging ditches are carried on throughout the winter months; but the winter of 1909–10 was an exception to the rule, the ground remaining frozen for about two months.

TABLE I.—*Maximum, minimum, and mean temperatures, by months, at Fallon, Nev., for six years, 1904–1910.*

Month.	1904		1906		1907.		1908.		1909		1910		Mean of the means.
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
January	56	0	60	6	64	−2	56	12	51	29	42	−15	30.2
February	65	9	69	11	72	22	71	16	62	13	64	−12	38.2
March	69	15	.....	.....	70	12	78	15	68	15	73	24	43.7
April	83	20	84	18	81	29	89	18	77	21	89	22	52.1
May	85	28	84	31	88	29	80	25	88	26	102	30	56.6
June	93	39	90	38	93	33	93	35	97	43	101	40	64.9
July	98	48	101	53	99	44	101	51	98	39	103	38	74.3
August	.....	.....	98	42	99	40	103	36	98	43	98	39	71.8
September	.....	.....	90	34	95	29	94	26	90	31	90	32	61.4
October	76	30	88	22	.....	.....	82	15	80	24	88	23	51.2
November	.....	.....	81	−1	76	18	68	6	70	12	75	13	40.8
December	.....	.....	59	−2	72	15	56	−2	55	8	66	12	32.8

[1] The records for 1905 are not obtainable.

FROSTS.

The length of the summer period between frosts is shown in Table II. This table is only approximately correct, for the reason that the dates of the killing frosts are reported from the different parts of the project by various individuals, who may have a diversity of opinion as to what constitutes a "killing" frost. The table will, however, be helpful in indicating approximately the length of the growing season.

TABLE II.—*Dates of the last killing frost in spring and the first killing frost in autumn at various points on the Truckee-Carson project, 1905–1910, inclusive.*[1]

Locality.	Time of year.	Dates of killing frosts.					
		1905.	1906.	1907.	1908.	1909.	1910.
Carson Dam	Last in spring	.....	.....	Apr. 20	May 15	May 11	Apr. 22
	First in autumn	.....	Sept. 4	Oct. 29	Sept. 26	Oct. 30	Oct. 13
Leetville	Last in spring	.....	.....	May 2	May 9	May 13	Apr. 12
	First in autumn	.....	Oct. 4	Sept. 19	Sept. 26	Sept. 22	Oct. 13
Soda Lake	Last in spring	.....	.....	.....	May 16	May 14	Apr. 15
	First in autumn	.....	Oct. 18	Sept. 18	Sept. 25	Oct. 22	Oct. 13
Fallon	Last in spring	.....	May 31	May 14	May 30	May 24	May 16
	First in autumn	.....	Oct. 4	Sept. 19	Sept. 25	Sept. 22	Sept. 13
Hazen	Last in spring	.....	May 28	June 15	.....	.....	.....
	First in autumn	Oct. 8	Oct. 18	.....	.....	.....	.....
Fernley	Last in spring	.....	.....	June 14	May 8	May 28	Apr. 21
	First in autumn	.....	.....	Oct. 4	Sept. 26	Oct. 8	Oct. 13

[1] Compiled from the official reports of the United States Weather Bureau.

The occurrence of frosts is markedly influenced by the local topography of the land, as the cold air settles into the low places when the air is calm. Some observations made at the experiment farm in the spring of 1910 show the extent of this influence in a typical location. Two registering minimum thermometers were placed 190 feet apart, one of them in a hollow between two long, low hills, and the other on the highest point on one of the hills at an elevation of 13½ feet above the level of the one in the hollow. During April, 1910, the average minimum temperature on the hill was 4.2 degrees warmer than in the hollow. The record was kept 17 days in May, during which time the average minimum hill temperature was 3.2 degrees warmer than in the hollow. The greatest differences occurred on those nights when there was little or no wind. A maximum difference of 10 degrees occurred on the night of April 25. No instance is recorded when the minimum temperature was higher in the hollow than on the hill. These results, given in detail in Table III, indicate that tender fruits and vegetables will be in less danger of being injured by late spring frosts when planted on the higher lands.

TABLE III.—*Daily minimum temperatures recorded by two thermometers, one on a hill and the other in a low place, on the Truckee-Carson Experiment Farm, Fallon, Nev., during the months of April and May, 1910.*[1]

Date.	Temperature.		Difference.	Date.	Temperature.		Difference.
	On hill.	In draw.			On hill.	In draw.	
1910.	° F.	° F.	° F.	1910.	° F.	° F.	° F.
Apr. 1	36	32	4	Apr. 28	44	41	3
2	39	37	2	29	36	33	3
3	38	36	2	30	47	46	1
4	23	19	4				
5	29	22	7	Average for month	39.0	34.8	4.2
6	46	44	2				
7	34	31	3	May 1	35	34	1
8	38	34	4	2	38	36	2
9	40	35	5	3	43	42	1
10	40	37	3	4	38	38	0
11	41	40	1	5	26	24	2
12	30	28	2	6	34	28	6
13	39	35	4	7	42	38	4
14	38	36	2	8	45	37	8
15	28	23	5	9	(2)	50	.....
16	32	24	8	10	42	41	1
17	36	29	7	11	39	38	1
18	39	31	8	12	40	35	5
19	50	44	6	13	48	45	3
20	43	42	1	14	49	46	3
21	34	31	3	15 to 27	(2)	(2)	.....
22	37	30	7	28	44	40	4
23	40	32	8	29	54	51	3
24	45	37	8	30	54	47	7
25	45	35	10	31	56	52	4
26	50	48	2				
27	53	51	2	Average for month	42.7	39.5	3.2

[1] Distance apart of thermometers, 190 feet; difference in elevation, 13½ feet.
[2] Records not obtained.

RAINFALL.

The rainfall in the region of the Truckee-Carson project is so light as to be of little benefit to growing crops. Table IV gives the monthly precipitation for the five years 1906 to 1910, inclusive.

TABLE IV.—*Annual rainfall at Fallon, Nev., 1906–1910.*[1]

Month.	1906.	1907.	1908.	1909.	1910.	Average.
January	.....	0.39	0.49	0.60	1.98	0.86
February	.....	.30	.48	.25	.04	.29
March	.....	1.40	.02	.74	.10	.56
April	0.76	1.06	.28	.19	.28	.51
May	.72	.39	.92	.02	.0	.41
June	.57	.66	.05	.27	.10	.33
July	.01	Trace.	.15	Trace.	.05	.04
August	Trace.	.38	.02	.06	.0	.09
September	.29	.12	.62	.41	.45	.38
October	Trace.	.41	.17	.70	.46	.35
November	.44	.21	Trace.	.71	.02	.28
December	1.56	.48	.07	1.30	.66	.81
Total annual	.....	5.80	3.27	5.25	4.14	4.91

[1] Compiled from official reports of the United States Weather Bureau.

TREE PLANTING ON THE PROJECT.

Tree planting should be one of the first things undertaken by each farmer, so that windbreaks may be established as soon as possible. They should be arranged so as to protect the gardens, farm buildings, and orchards from the south and west winds. The larger fields may also be protected by planting rows of trees along the west sides. The best trees to use for the purpose are the Carolina poplar, balm of Gilead, black locust, Russian oleaster, and tamarisk.

CAROLINA POPLAR.

The Carolina poplar (*Populus deltoides carolinensis*) is a rapid-growing tree that can be propagated easily from cuttings. It is closely related to the common cottonwood, but is more symmetrical in shape and seems to make more rapid growth. Ten-inch cuttings set out in April, 1910, at the experiment farm made a growth of 4 to 8 feet during that season. Nurserymen have propagated it by means of cuttings from staminate or male trees only; therefore, it does not have the disagreeable habit of shedding "cotton" each spring. The chief value of the Carolina poplar is for fuel, windbreak, and ornamental purposes. The wood is too soft to be of much value for timber or for fence posts unless a preservative is used. Cuttings may be obtained by local farmers from the Truckee-Carson Experiment Farm.

NORWAY POPLAR.

The Norway poplar is very similar to the Carolina poplar in appearance. Some nurserymen claim that it makes a more rapid growth, but we have been unable to observe any difference between the two varieties on the Truckee-Carson project.

COTTONWOOD AND BALM OF GILEAD.

The cottonwood (*Populus deltoides*) and balm of Gilead (*Populus balsamifera*) are desirable species of the poplar family. Both species have a more spreading habit than the Carolina poplar and probably do not make such rapid growth. The pistillate or female cottonwoods are not so desirable, on account of their habit of shedding "cotton." Cuttings from staminate or male stocks produce trees that do not have this defect. Either species is easily propagated from cuttings, or seedlings of the cottonwood may be obtained along the watercourses, where they grow abundantly.

BLACK LOCUST.

The black locust (*Robinia pseudacacia*) makes a rapid growth and produces an excellent timber for farm purposes. The wood is hard and tough, making it valuable for fuel, whiffletrees, crossbars, ax handles, and general repair work. It is slow to decay when in contact with the soil, so that it is one of the best materials to use for fence posts. When the black locust is cut down new shoots put out from the stump and grow straighter and with greater rapidity than the original tree. It has the bad habit of suckering, so that the locust plantation is liable to grow up into an impenetrable thicket unless it is well cared for. The tree is easily grown from seed, or it may be propagated from root cuttings. Seed can be obtained from nurseries in the Central States at about 70 cents a pound, or 1-year-old seedling trees can be purchased for about $3 a thousand.

TAMARISK.

The tamarisk (*Tamarix* sp.) is a quick-growing tree or shrub, useful for windbreaks and hedges. The foliage is light and feathery and decidedly ornamental. It is easily grown from cuttings, which will be supplied by the experiment station during the early spring months. These cuttings are from 8 to 10 inches in length, and for windbreaks or hedges should be set in the ground 2 feet apart in the row. This will make a beautiful, dense hedge within two years. Cutting back the ends of the branches each winter will cause it to branch more and result in a thicker hedge.

RUSSIAN OLEASTER.

The Russian oleaster (*Elaeagnus angustifolia*), a close relative of the native buffalo berry, is a very desirable tree to use for hedges and windbreaks. It should find a place about every farm home on the Truckee-Carson project to protect the house, garden, and orchard from the winds, to outline driveways, or to hide unsightly buildings. When the seedlings are planted 3 or 4 feet apart it makes a dense hedge in two or three years that will turn live stock. Cutting back a little each year causes the hedge to thicken. When grown isolated, it makes a symmetrical tree with a round top.

It is sometimes referred to as the Russian wild olive, but since it does not belong to the olive family, but to the oleaster family, the

FIG. 1.—Hedge of Russian oleaster (*Elaeagnus angustifolia*) on the Truckee-Carson Experiment Farm. This hedge was set out in the spring of 1908, 1-year-old seedlings being used. (Photographed in August, 1910.)

name Russian oleaster is more accurate and should be used. This species is native to northern Persia, southern Siberia, and northern China. Seed can be obtained in small quantities from the experiment farm each year, or the seedlings may be obtained from some nurserymen in the western part of the Mississippi Valley.

A row of several hundred 1-year seedlings was set out at the experiment farm in April, 1908. In the fall of 1909 the hedge was 7 feet high and so dense as to be impenetrable. During 1910 this hedge was kept pruned back to a height of 7 feet, and the result was a beautiful, symmetrical hedge, as shown in the accompanying figure (fig. 1). Some trees that were not pruned are now from 10 to 15 feet in height, the result of three years' growth from the 1-year seedlings. An abundant crop of seed was produced the third year after

planting. In Dakota the tree is said to reach a height of 25 to 35 feet in 10 years.

CLEARING AND LEVELING THE LAND.

To prepare the desert soil for irrigation it is first necessary to clear the land of the brush that grows on practically all the soil suitable for crop production. The vegetation which has to be cleared away in the preparation of the land is chiefly greasewood (Sarcobatus), rabbit brush (Chrysomanthus), and sagebrush (Artemesia). This brush may be removed by grubbing, dragging a railroad iron over it, or, where it is not too large, by the use of the common disk harrow. The brush can often be used for fuel or for the building of windbreaks or corrals. It is important not to clear the brush off more land than can be irrigated and put into crop at once, as clearing it exposes the soil to the action of the wind, which often causes serious damage to crops lying to leeward.

Some of the land on the project is naturally almost level, and the cost of getting it ready for crops is very low. Other areas are covered with small sand hills, and the cost of leveling these is considerable. The cost of clearing and leveling the land varies from $8 to $100 per acre. Most of it can be cleared and leveled at a cost of $15 to $35 per acre.

AGRICULTURE OF THE PROJECT.

Alfalfa has been in the past the principal source of income to the farmers on the project, and this will probably continue to be true for some years. Barley and other grains have been grown to some extent on portions of the project, but under most conditions grain has not been as profitable as alfalfa.

On account of the distance to large markets, an overproduction of alfalfa or any bulky crop results in a low price for that product; hence, it is well to avoid as far as possible any local overproduction of bulky products. If the crop production of the project were to be limited to alfalfa, without at the same time providing live stock for its consumption, the result would be unprofitable market conditions. These conditions were approached at Fallon in the fall of 1910, when the price of alfalfa dropped to $6.50 a ton in the stack.

No commercial orchards have been planted, but there are sections of the project on the higher lands having good drainage where fruit growing might become commercially profitable. If such plantings are made, care should be taken to put them only on land which is not subject to a high water table and where the air drainage is good, for under other conditions the trees are almost sure to be short lived and to suffer from spring frosts. There are numerous small orchards on the project and in some of them the trees are doing well.

FORAGE CROPS.

ALFALFA.

Alfalfa is the great money crop of this region. It is seeded any time after March 1 until the end of August, although April, May, and August are probably the best months in which to seed. June and July are so hot that there is a tendency for the soil to dry out rapidly and check the growth of the tender seedlings.

The rate of seeding is from 12 to 20 pounds per acre. Twelve pounds per acre is sufficient seed for a good stand in the lighter soils, where there is little trouble in getting the seed to germinate. In the heavier soils, or in land that crusts badly, it is often advisable to sow more than 15 pounds per acre. It is generally broadcasted and harrowed in, but it is preferable to put it in with the grain drill. In the light sandy soils the alfalfa may be safely sown 1½ inches deep, but this is too deep for the heavier soils. The seed should be sown as deep as is consistent with the character of the soil, as the deep-sown seed is less liable to dry out after germinating.

Fields should be irrigated and well prepared immediately before seeding. The seed is then sown in the moist soil and should germinate at once. If the character of the soil will permit it is best to let the seed come up before again irrigating, as the water always packs and cools the soil and sometimes causes a crust to form, through which the alfalfa does not readily penetrate.

The usual method of irrigating alfalfa about Fallon is by flooding in checks. Near Fernley the practice is to irrigate by the furrow or corrugation system.

While the alfalfa is young rather frequent irrigations are needed, but as the alfalfa grows older and the roots penetrate deeper, fewer irrigations should be given. Where there is poor drainage and danger from a high water table special care should be taken not to overirrigate, and water should be applied only when the alfalfa shows signs of actually needing it. Where there is good drainage more frequent applications of water are not so liable to produce bad results.

It is often difficult to get a satisfactory stand of alfalfa, either from the crusting of the soil, so that the alfalfa seedlings can not break through, or from the blowing of sand, which sometimes cuts off the young plants at the surface of the ground.

These difficulties may be partly overcome by first seeding grain on the land in the spring and when the grain is a few inches high seeding in the alfalfa with a grain drill. The stand of grain partially shades the ground, thus somewhat preventing the crusting of the soil, and it effectually protects the alfalfa seedlings from the drifting of the sands. The grain should be cut for hay before it is mature,

in order to give the alfalfa a chance to make a good growth before cold weather sets in.

Only the purest alfalfa seed should be sown. Much alfalfa seed has been sown in the vicinity of Fallon that contains dodder and sweet clover. Both of these are highly undesirable weeds in an alfalfa field. The dodder especially is hard to get rid of. Before purchasing seed the farmer should test its germinating power. This can be done by putting some of the seed between two layers of moist cloth in a covered dish, which is kept for two or three days in a moderately warm room. If there is any doubt as to whether or not the alfalfa seed contains dodder, a sample may be sent to the experiment farm for examination.

In breaking an alfalfa sod to use the land for another crop, the alfalfa should be "crowned"—that is, the land plowed to a depth of 2 or 3 inches with a plow having a sharp share. After "crowning" the field should lie without irrigation for six weeks or more, when it may be plowed deep and put into crop without serious trouble. If an alfalfa field is plowed deep the first time, the crowns have sufficient roots still attached to them to permit the development of new shoots and it is very hard to keep these reestablished plants in subjection.

On the Truckee-Carson project three cuttings of alfalfa are obtained each year and the average yield is probably about 4 tons per acre. To secure the maximum yield the alfalfa should be cut before the new basal shoots (that appear soon after the alfalfa begins blossoming) are high enough to be cut by the mower. To cut off these basal shoots retards the new growth. Alfalfa may be safely pastured in the fall after the third cutting, provided care is taken to see that it is not cropped too closely.

At the present time alfalfa is grown for hay production almost to the exclusion of every other forage crop. To replace alfalfa any other crop must possess some point of superiority, either in the yield or in the quality of forage produced. Such a crop has not yet been found for this region.

GRAIN HAY.

Grain hay is an excellent crop in connection with alfalfa when the latter is first seeded. The grain protects the young alfalfa from the winds and to some extent prevents the crusting of the soil. A small early crop of hay is produced that may prove very acceptable to the farmer who has as yet no well-established field of alfalfa.

PEARL MILLET AND SORGHUM.

Pearl millet and sorghum produce about the same yield per acre as alfalfa, but they are more expensive to raise and the quality of the forage is not so good. Sorghum, however, may be seeded on new

land in preference to alfalfa when a hay crop is necessary the first season. Sorghum usually grows well on new land and is fairly tolerant of alkali. It will probably give better yields if sown thickly in rows about 3 feet apart and cultivated once or twice during the season, though where the soil is in good tilth a better quality of hay may result from sowing the seed broadcast or with a grain drill.

CORN.

Corn sown thickly, either in rows to be cultivated or with a grain drill, so as to produce small stalks, may prove valuable to grow in a small way for the feeding of dairy stock. Corn should produce from 4 to 10 tons of fodder per acre and it is a crop that is used extensively in the dairy sections for feeding milch cows. On some of the rich black lands of the project corn planted for grain is a profitable crop, and with the development of a demand for this grain for feeding live stock it will probably be extensively grown.

PASTURE CROPS.

There are not at present any successful pastures in the Truckee-Carson project where a mixture of grasses has been used. With a pasture of pure alfalfa or clover there is always danger of bloat with dairy and beef cattle. At Fernley there is a field of mixed alfalfa and smooth brome-grass (*Bromus inermis*) which has been cut annually for hay. This field could probably be safely pastured without danger of bloat, but it is not known whether brome-grass can be successfully grown on the lower land of the project at Fallon. Since brome-grass starts very slowly when first sown, it might be well to sow the seed with a grain crop and allow the grass to get fairly well started and then seed the alfalfa the following year. Or where an alfalfa stand has become thin from hard pasturing, brome-grass might be seeded in with a grain drill after disking the land thoroughly.

SUGAR BEETS.

Now that a sugar-beet factory has been built, sugar beets are likely to become one of the principal money-making crops of the Truckee-Carson project. Good beets have been produced experimentally on the river-bottom soil, sandy-desert soil, and the black soil of the Stillwater and Douglass districts. Sugar beets are quite tolerant of alkali, but beets of good form and quality are not produced on low, wet soils. Sugar beets grown on plats having a high water table (less than 2½ feet) have a tendency to be short and much branched.

It has been the experience of sugar-beet growers in other sections where alfalfa is grown that the beets should not be planted on freshly

plowed alfalfa lands, as the undecayed roots and crowns of the alfalfa seriously interfere with the proper seeding and cultivation of the beets. It is therefore usually advisable to grow some intervening crop, such as potatoes, between alfalfa and sugar beets. Wherever possible, land that is to be used for sugar beets should be plowed the previous autumn and before the beets are planted the land should be thoroughly irrigated and worked into a fine tilth. This will not only insure a more uniform germination of the seed, but will also make the first cultivation and hand weeding much easier.

Table V presents the results of analyses of sugar beets made during the four years 1907 to 1910, inclusive. In 1907 and 1908 the beets analyzed were rather small, which probably partly accounts for the higher sugar content shown for those years. The analyses in 1907 and 1908 were made by the United States Department of Agriculture; those in 1909 and 1910 by Prof. Sanford Dinsmore, of the University of Nevada. Accurate yields of beets in tons per acre have not been obtained.

TABLE V.—*Analyses of sugar beets grown on the Truckee-Carson Experiment Farm, 1907 to 1910, inclusive.*

Year.	Number of samples.	Type of soil.	Sugar in juice.	Sugar in beet.	Purity.
			Per cent.	*Per cent.*	*Per cent.*
1907	18		21.55		87.3
1908	21	Adobe	18.2		87.8
	21	Sandy	20.0		89.95
1909	34	All types	16.26	15.5	86.0
	7	New land	15.8	15.0	86.9
	8	Gardens and alfalfa land	16.95	16.1	86.4
	6	Stillwater and Douglass districts	17.1	16.4	89.78
	13	Unknown	15.74	14.93	81.8
1910	3	Miscellaneous	17.0	16.11	87.5

VEGETABLES.

Most of the common vegetables are so easily grown that every farmer should have a garden large enough to supply his family throughout the season. On account of the distance to large markets, market gardening on a large scale is not likely to be profitable, except possibly with potatoes and onions.

The following vegetables are the kinds most easily grown: Watermelons, muskmelons, squashes, pumpkins, cucumbers, tomatoes, turnips, carrots, table beets, radishes, lettuce, kohl-rabi, onions, potatoes, egg-plant, wonderberries, and garden huckleberries.

The reports of the vegetables that follow are from results obtained at the Truckee-Carson Experiment Farm.

WATERMELONS.

Watermelons are easy to grow and are very productive on the sandy soils of the project. On the experiment farm 12,104 pounds of marketable melons were harvested from one-seventh of an acre. At

this rate the yield was over 42 tons per acre. As the growing season for melons is somewhat short in this section only the quick-growing varieties should be grown. Table VI shows the results obtained at the experiment farm during the season of 1910.

TABLE VI.—*Watermelon yields, etc., on the Truckee-Carson Experiment Farm in 1910.*

Varieties.	Total yield.[1]	Average weight.	Remarks.
	Pounds.	*Pounds.*	
Kentucky Wonder	1,172	12	
Fordhook Early	1,025	10	Generally good; solid.
Harris Early	947	7½	Generally hollow and stringy.
Kleckley's Sweet	944	12½	Sweetest melon on trial.
Pride of Nebraska	921	9½	Seems identical with Kleckley's Sweet.
Sweetheart	825	15½	
Kolb's Gem	820	13	
Cole's Early	819	10	Much like Harris; often hollow.
Dixie	755	10	Very good quality.
Ironclad	707	14	

[1] Yields given are from rows 80 feet long.

The best results with watermelons and similar vegetables will probably be secured by first opening a deep furrow with a plow, filling this furrow with well-rotted manure, and turning the earth back over the manure and planting the seed on the ridge thus formed. When putting in the seed the ground should be firmed down with a hoe to insure bringing the seed into contact with the moist earth, so that it may germinate promptly. Care should be used to prevent flooding the soil above the seed and causing it to form a hard crust.

MUSKMELONS.

Muskmelons are easily grown and especially on the lighter soils are very productive. The following table gives the names of the varieties grown and the comparative yields from rows 80 feet in length. The Rocky Ford was the most popular variety. The Khiva is a late-maturing variety, but will keep long into the winter.

TABLE VII.—*Muskmelon yields, etc., on the Truckee-Carson Experiment Farm in 1910.*

Variety.	Date of first picking.	Yield.	Remarks.
		Pounds.	
Rocky Ford	Aug. 9	355	No rotted or cracked melons; high average of quality and market condition.
Extra Early Hackensack	Aug. 5	412	A good early melon.
Strawberry	Aug. 12	357	Fine grain and quality; varies as to sweetness.
Osage	Aug. 22	293	Deep salmon flesh.
Burrell's Gem	Aug. 27	264	Best melon on Sept. 6.
Paul Rose	Aug. 16	210	
Khiva	(?)	(?)	A good variety for winter use.

PUMPKINS AND SQUASHES.

Pumpkins and squashes should be grown in every farmer's garden, as they are very prolific and are valuable for table use. The common field pumpkin and Japanese pie pumpkin are good varieties. The Golden Crookneck squash is one of the best for summer use, while the warty Hubbard is probably the best variety to store away for winter. The White Bush Scalloped is a commonly grown summer variety, but it does not have the richness of flavor of the Golden Crookneck.

CUCUMBERS.

The White Spine, Klondike, Long Green, and Everbearing cucumbers are desirable varieties for this section. The Gherkin is a small prickly variety that is used only for pickling. It is an abundant producer, and probably more people would grow this variety were its qualities better known.

TOMATOES.

Tomatoes usually produce a satisfactory crop, but are subject to the attack of a disease known as tomato wilt (*Fusarium* sp.). This disease attacks individual plants in the tomato plat. The first indication is a wilting of the leaves of the affected plants. The wilt becomes more noticeable from day to day and finally results in the death of the plants. No remedy is known, but the disease can be checked by growing tomatoes always on soil that has not recently been in that crop and by pulling and burning all diseased plants as fast as they appear. The following varieties of tomatoes are recommended for planting: Early Jewell, Dwarf Champion, New Stone, New Coneless, New Globe, Golden Queen.

At the experiment farm 1,190 pounds of tomatoes were produced from one-nineteenth of an acre, or a yield of over 11 tons per acre, in spite of the fact that over 25 per cent of the plants were affected with tomato wilt.

ONIONS.

On some of the soils of the Truckee-Carson project onions grow well, so that it is profitable to grow them for the market, but it would not be safe to attempt to grow them on a large scale on newly cleared land. They grow so well, however, that each farmer can easily grow enough for table use.

Good varieties for trial are the Mammoth Pompeii, Silver King, Prizetaker, and Red Wethersfield.

WONDERBERRIES AND GARDEN HUCKLEBERRIES.

The fruit of the wonderberry is about the size of the blueberry. It is quite agreeable to eat raw, and it makes good jams and pies. On account of its small size the fruit is slow to gather. The garden huckleberry is larger than the wonderberry, but is thicker skinned, requires more cooking, and does not have a pleasant taste when eaten raw. The pies and jams made from these two kinds of berries have a very similar taste. While these two fruits are far from perfection, they seem to be popular, at least in this section, and deserve a place in the family garden until more desirable fruits can be grown.

OTHER VEGETABLES.

Varieties of peppers grow well on some of the soils about Fallon, but on some of the newly worked desert soil they do not produce satisfactorily.

Potatoes grow best following alfalfa. To get the best results very careful irrigation must be given, so that the crop may make continuous growth without check until it approaches maturity, when no more water should be given, otherwise a second growth will result. Good varieties to grow are the Burbank, Peachblow, and Early Ohio.

FRUIT GROWING.

The following notes are the results of observations made during the autumn seasons of 1909 and 1910 while inspecting the orchards located on the older ranches in the project.

The first settlers along the Carson River made some fruit plantations at an early date after their settlement in the valley. These plantings were not large, as they were intended for home use. Many trees 25 and 30 years old are still to be seen. No extensive plantings are being made at this time, but many of the new settlers are putting out home orchards.

The old orchards have suffered in various ways. Before the more efficient irrigation system of the Reclamation Service was installed much damage was caused by drought in the latter part of the season. Overcrowding and general neglect have caused unthrifty trees and poor fruit. In these old apple orchards the trees were usually set 16 by 16 or 20 by 20 feet, with the result that the branches were soon interlocked and the vigor of the trees lessened. Many of the new settlers are making the same mistake. The right distance for apple trees in this region is about 30 by 30 feet.

The high-water table under some of the orchards seems to be killing out the trees.

The codling moth is the most troublesome orchard pest. No remedial measures have been taken to stay its ravages. Other insects noted are the flat-headed borer, woolly aphis, and red spider. The aphis does not appear to do great damage, but it is present in practically all orchards. Diseases of fruit trees do not appear prevalent. Pear blight has been noted, but it is not general.

Home orchards have been profitable in the past, and in view of the fact that orchard heaters have proved practical in many places it is not unreasonable to expect that large orchards may be commercially profitable, especially on the higher lands where there is good natural drainage. There are bench and sloping lands containing thousands of acres which could not be utilized before the opening of the Truckee-Carson project. These lands appear to be less frosty, and can not be troubled by the rise of ground water.

The mature home orchards that are found on the old ranches have not as a rule had good care, so it is hard to judge how well the various fruits would produce if they were given proper cultivation, pruning, thinning, and frost protection.

The kinds of fruit now growing on the project, chiefly on the old ranches, are as follows: Apples, pears, peaches, domestica plums, prunes, quinces, apricots, nectarines, cherries, grapes, and such small fruits as currants, gooseberries, and strawberries. Apples and pears are the surest bearers. Specific varieties of fruits can not at this time be recommended.

SUMMARY.

The Truckee-Carson Irrigation Project, in western Nevada, was one of the first of the new regions to be opened under the reclamation act of 1902. Practically all of the land for which water is available has now been taken up, about 35,000 or 40,000 acres being now under cultivation, most of it lying near the town of Fallon.

Near Fallon the United States Department of Agriculture operates an experiment farm, where farm tests are being made of the adaptability of various field, fruit, and garden crops, and where methods of reducing the salt content of the soil are being worked out.

Most of the soil is a light sandy loam, but there are large areas of fertile black soil, both of which types produce abundant crops. There are small, irregular areas of hard, impervious soil difficult to work and usually not producing satisfactory crops.

In those areas where it is impossible to grow crops on account of the high salt content of the soil, little or no advantage can result from flooding. Deep ditches should be put through to lower the water table. A comprehensive drainage system for the lower lands has been planned and partly constructed, and this when completed

will make it possible to keep the ground water below the limit of serious harm.

Windstorms severe enough to kill new seedings of alfalfa and injure small garden stuff occur occasionally in the spring. This difficulty may be obviated by planting windbreaks, which should be one of the first things undertaken. Carolina poplar, Norway poplar, cottonwood, balm of Gilead, black locust, tamarisk, and Russian oleaster are desirable trees for this purpose.

Records for six years show a maximum temperature at Fallon of 103° F. and a minimum of —15° F. As a general rule, farm operations are carried on throughout the winter months. The length of the summer period varies in different parts of the project, and the local topography has considerable influence on the occurrence of frosts. The rainfall of the project is so light as to be of little benefit to crops, the average fall for the past five years at Fallon being 4.91 inches.

The land may be cleared of brush by grubbing, dragging, or disking. Most of the land can be cleared and leveled at a cost of $15 to $35 an acre.

Alfalfa is the principal source of income to the farmers. Three cuttings are secured, and the average yield is about 4 tons per acre. Barley and wheat have been grown to some extent, but under most conditions grain is not as profitable as alfalfa. The overproduction of alfalfa without sufficient live stock to consume it, with a consequent low price of the hay, is a possible danger. Grain, pearl millet, sorghum, and corn may be grown as hay crops, but as yet no forage crop has been found to replace alfalfa.

There are at present no successful pastures on the project where a mixture of grasses has been used. With pure alfalfa or clover there is always danger of bloat with dairy and beef cattle, and suitable grasses for pasture are much needed.

There are as yet no commercial orchards on the project, but there are sections where fruit growing might become commercially profitable. Home orchards have been profitable in the past. Apples and pears are the surest bearers, but peaches, domestica plums, prunes, quinces, apricots, nectarines, cherries, grapes, and such small fruits as currants, gooseberries, and strawberries are also grown. Specific varieties of fruits can not at this time be recommended.

Experiments with sugar beets show that this crop may be profitably grown on river-bottom soil, sandy-desert soil, and the black soil of certain districts. The establishment of a sugar-beet factory on the project will probably give impetus to this industry.

Most of the common garden vegetables are easily grown, watermelons and muskmelons being especially productive on the sandy soils of the project.

Potatoes grow best following alfalfa. To get the best results careful irrigation should be given to insure continuous growth. Good varieties to grow are the Burbank, Peachblow, and Early Ohio.

Approved:

JAMES WILSON,
Secretary of Agriculture.

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